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# MASS TRANSIT

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### VICE PRESIDENT, MARKET LEADER - INFRASTRUCTURE & AVIATION GROUP

Brandon Williamson  
(512) 739-2102 | [BWilliamson@MassTransitmag.com](mailto:BWilliamson@MassTransitmag.com)

**EDITOR IN CHIEF** Mischa Wanek-Libman  
(224) 324-8532 | [MWanek@MassTransitmag.com](mailto:MWanek@MassTransitmag.com)

**ASSOCIATE EDITOR** Brandon Lewis  
(216) 298-3269 | [BLewis@MassTransitmag.com](mailto:BLewis@MassTransitmag.com)

**ASSOCIATE EDITOR** Eman Abu-Khaled  
[EAbukhaled@MassTransitmag.com](mailto:EAbukhaled@MassTransitmag.com)

**CONTRIBUTORS** Jeff Tuzik, Erin Plemons

**MULTIMEDIA ACCOUNT MANAGER** Kristy Dziukala  
(815) 353-9493 | [Kristy@MassTransitmag.com](mailto:Kristy@MassTransitmag.com)

**INSIDE SALES REPRESENTATIVE** Amy Stauffer  
(920) 259-4311 | [AStauffer@MassTransitmag.com](mailto:AStauffer@MassTransitmag.com)

**LIST RENTALS REPRESENTATIVES** InfoGroup  
**MICHAEL COSTANTINO**  
(402) 836-6266 | [Michael.Costantino@infogroup.com](mailto:Michael.Costantino@infogroup.com)  
**KEVIN COLLOPY**  
(402) 836-6265 | [Kevin.Collopy@infogroup.com](mailto:Kevin.Collopy@infogroup.com)

**PRODUCTION MANAGER** Patti Brown

**AD SERVICES MANAGER** Deanna O'Byrne

**ART DIRECTOR** Erin Brown

**AUDIENCE DEVELOPMENT MANAGER** Debbie Dumke

**DIGITAL AUDIENCE DEVELOPMENT MANAGER** Ryan Johnson



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**EVP TRANSPORTATION** Kylie Hirko



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PO Box 3257, Northbrook IL 60065-3257

### ARTICLE REPRINTS

[reprints@endeavorb2b.com](mailto:reprints@endeavorb2b.com)

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# How to measure transit insecurity?

A series of research efforts during the past few years, are looking to better understand the role transit insecurity has within communities.

**A**s the transit industry continues its evolution in data collection and analysis, central but hard to measure metrics are being discussed—especially those that could shed light on where transit services are needed most. One of these metrics is transit insecurity.

In February 2023, the Federal Transit Administration (FTA) awarded a \$6 million grant to the University of Minnesota to design a program, Mobility, Access and Transportation Insecurity (MATI), that identifies and addresses the contributing factors leading to transportation insecurity. The FTA noted nationally, several well-established policies and programs aim to address food insecurity and housing insecurity, but not transportation insecurity.

University of Minnesota researchers are analyzing how the metric can be used to study the link between transit insecurity and access to school, work and social activities. FTA says one in four Americans is unable to access transportation regularly and reliably and cites research indicating “transportation insecurity is a significant factor in persistent poverty.”

The challenge, according to Assistant Professor Alexandra Murphy from the University of Michigan Department of Sociology, is that transit insecurity is difficult to measure, often gets overlooked and a shared definition to discuss the topic is lacking.

Mineta Transportation Institute (MTI) published a report in July 2021, “No Ticket to Ride: A Systematic Definition of Transit Insecurity,” that reviewed a series of articles published between 2005 and 2020 to establish a definition of transit insecurity. The result was a definition of transit insecurity being “the inability to consistently access or afford a reliable transportation system leading to demonstrable negative impacts on a person or community. Persons and communities experiencing transit insecurity may directly perceive these negative effects, though they also may not.”

This MTI analysis also determined four primary factors that contribute to a person or community being transit insecure: (1) income level, (2) travel distance, (3) travel duration and (4) accessibility.

University of Minnesota researchers have a simplified definition: The experience of being unable to move from place to place in a safe or timely manner. This has assisted researchers in the development of the Transportation Security Index, which is described as “the first validated measure of transportation security that offers insights into who experiences transportation insecurity and enables researchers and practitioners to determine which interventions can improve this condition.”

The MATI program will select up to eight applicants in Phase 1 of its FTA-funded project to receive up to \$150,000 to support the development and submission of a plan for a proposed demonstration project to address transportation insecurity. Phase 2 will provide \$700,000 to up to four applicants for the full deployment of the proposed demonstration.

*Mass Transit* will continue to keep an eye on these developments as research progresses.

“

The FTA noted nationally, several well-established policies and programs aim to address food insecurity and housing insecurity, but not transportation insecurity.

”

✉ [mwanek@masstransitmag.com](mailto:mwanek@masstransitmag.com)

☎ 224-324-8532

🌐 [linkedin.com/in/mischawaneklibman](https://www.linkedin.com/in/mischawaneklibman)

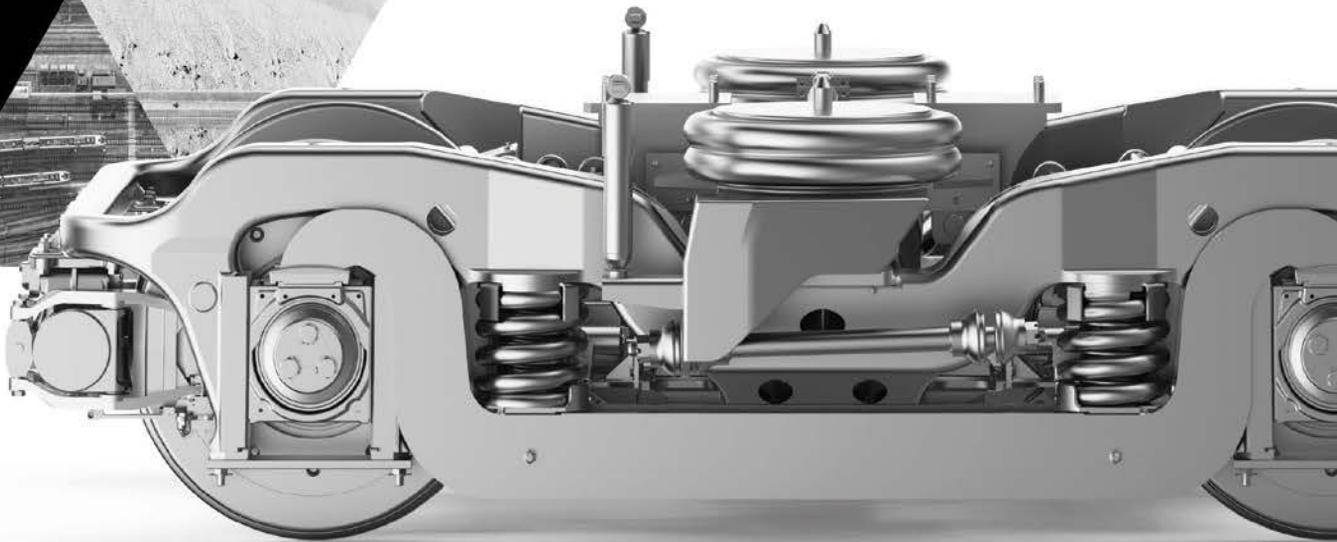


*Mischa Wanek-Libman*

Mischa Wanek-Libman,  
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# People & Places



The first portion of Sound Transit's Link 2 Line opened April 27.

Photo: Sound Transit

## First portion of Sound Transit Link 2 Line begins service

The initial segment of Sound Transit's Link 2 Line opened on April 27. The 6.6-mile segment of the Link 2 Line includes eight stations in Bellevue and Redmond, Wash. The initial segment terminates at the South Bellevue Station at the west end and the Redmond Technology Station on the east. Two-car trains run every 10 minutes, 16 hours a day, seven days a week. The full 2 Line is expected to open in 2025.

[MassTransitmag.com/55021719](https://www.masstransitmag.com/55021719)

### Brightline West breaks ground on high-speed rail system connecting southern California and Las Vegas

► Brightline West has broken ground on a 218-mile high-speed rail system that will connect Las Vegas, Nev., to southern California. The rail line will be constructed in the middle of the I-15 in the western portion of the U.S. and is based on Brightline's vision to connect city pairs that are too short to fly and too far to drive. Brightline West will run zero-emission, fully electric trains capable of speeds of 200 miles per hour. The project was recently awarded \$3 billion in funding from the Infrastructure Investment and Jobs Act. The rest of the project will be privately funded and has received a total allocation of \$3.5 billion in private activity bonds from the U.S. Department of Transportation.

[MassTransitmag.com/55020160](https://www.masstransitmag.com/55020160)

### Metro Gold Line set to open March 22, 2025, in the Twin Cities

► The Metro Gold Line — Minnesota's first bus rapid transit (BRT) line to operate primarily within bus-only lanes — will open on March 22, 2025. The new line will connect Woodbury to downtown Saint Paul, Minn. The Gold Line is one of three new BRT lines Metro Transit will open next year, expanding the region's network of Metro lines that provide reliable, all-day service and stations with amenities such as heated and lit shelters.

[MassTransitmag.com/55001857](https://www.masstransitmag.com/55001857)

### USDOT's Build American Bureau approves first TOD TIFIA loan for Mt. Vernon Library Commons Project

► The U.S. Department of Transportation's Build America



A rendering of the Mt. Vernon Library Commons.

Image: USDOT

Bureau has approved its first Transit-Oriented Development Transportation Infrastructure Finance and Innovation Act loan for up to \$26.8 million for the Mt. Vernon Library Commons Project in Washington state. The project includes a multi-use building with a public library, community center, meeting rooms, commercial kitchen, parking garage, public restrooms, STEM center, computing space and numerous electric vehicle chargers. The project, slated to be completed this summer, encompasses half a city block in downtown Mount Vernon, Wash., and will be a short walk from Skagit Station, Skagit County's multi-modal transportation center.

[MassTransitmag.com/55036818](https://www.masstransitmag.com/55036818)



Pierce Transit, in partnership with MultiCare, has cut the ribbon on the Stream Community Line.

Photo: Pierce Transit

### Pierce Transit cuts ribbon on Stream Community Line

► Pierce Transit has cut the ribbon on its new Stream Community Line. The high-capacity transit service launched April 1 in partnership with MultiCare and offers a frequent, rapid and convenient weekday morning and afternoon service between Spanaway and Tacoma Dome Station in Tacoma, Wash. Stream runs on weekdays from 5:30 a.m. to 7:30 a.m. and from 4 to 7 p.m. to help those riders who commute to and from downtown Tacoma and who connect to other local and regional transit services.

[MassTransitmag.com/55022098](https://www.masstransitmag.com/55022098)

## PEOPLE IN THE NEWS

### San Diego Association of Governments (SANDAG)



SANDAG has tapped **Mario Orso**, the current chief deputy director of Caltrans District 11, to serve as the next CEO of SANDAG. Orso will be responsible for leading more than 400 SANDAG employees, will oversee a \$1.2 billion annual budget and will report directly to the SANDAG Board of Directors. He will begin his three-year contract with the agency on June 17, 2024.

[MassTransitmag.com/55021780](https://www.masstransitmag.com/55021780)

### Long Island Rail Road (LIRR)



**Rob Free** has been named the 42nd president of the LIRR by the MTA. Free has been serving as the LIRR's acting president for the past six months. As president, Free will oversee LIRR's 24/7 service, 700 miles of tracks and 126 stations – which includes three of the top five busiest commuter railroad stations in North America.

[MassTransitmag.com/55017834](https://www.masstransitmag.com/55017834)

### Tompkins Consolidated Area Transit (TCAT)



TCAT's Board of Directors has appointed **Matthew Rosenbloom-Jones** as the agency's general manager. Rosenbloom-Jones was named TCAT GM on April 12 after serving the role on an acting basis for six weeks. Prior to this position, Rosenbloom-Jones worked as a transit director for a Wisconsin transit agency.

[MassTransitmag.com/55018131](https://www.masstransitmag.com/55018131)

### WeGo Public Transit



**Patrick Hester** was promoted by WeGo to the position of deputy chief operating officer of assets and infrastructure. He began at the agency as a bus operator and rose through the ranks. Most recently, he was serving as a facilities manager for WeGo.

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**U.S. Rep. Earl Blumenauer (center), accepts the APTA Congressional Legacy Award for his commitment to advancing public transportation throughout his career.**

Photo: APTA

# Rep. Blumenauer led a movement of connection and choice

Rep. Earl Blumenauer’s time in public service has been spent advocating for causes that give people more choices in how they live, move and connect within their communities.

**BY MISCHA WANEK-LIBMAN, EDITOR IN CHIEF**

**Rep. Earl Blumenauer (D-OR-3) has been a champion** of sustainable, equitable infrastructure and mobility during his more than 50-year career in public service.

He is credited with jump starting the modern streetcar movement, advocating for active transportation infrastructure, particularly bike lanes, and delivering policy wins, including the Inflation Reduction Act, which included significant climate and energy investments and creating the Small Starts funding mechanism under the Federal Transit Administration’s Capital Investment Grants Program.

These efforts support his quest to create livable communities – places where residents are safe, healthy and economically secure – and where the federal government works with stakeholders at the state and local level and with individuals to create value people need for their lives.

“I think our work on livable communities is a way to bridge that gap, to bring people together to solve problems rather than create new ones,” said Rep. Blumenauer. “It’s so important to bring people together not divide them. There’s a lot of power in that concept and we’ve seen it work.”

One of the areas where this concept has worked is in Portland, Ore., the congressman’s hometown, and where he spent his early years in elected office in the Oregon State Legislature and Multnomah County Commission working on several issues, including efforts to move past a car-centric approach to urban planning.

At the American Public Transportation Association’s (APTA) Mobility Conference held in Portland this past

April, Rep. Blumenauer said he felt he was “chasing the ghost of Robert Moses,” who was commissioned by the city in the 1940s and developed a public works plan rooted in freeway construction.

“If we had taken the terrible path of implementing Robert Moses’ vision, we would have had one in 10 people in Portland live immediately adjacent to a freeway or having been moved to make way for it and that [would have] had devastating consequences,” explained Rep. Blumenauer.

While the plan Moses developed for Portland was deemed too expensive to implement, his vision influenced freeway construction in the region, including that of Interstate 5 in the 1960s, which divided the Albina neighborhood – a then-thriving Black community. Rep. Blumenauer called the construction of the interstate “culturally devastating in terms of economic impacts” to the neighborhood.

The U.S. Department of Transportation recently awarded a \$450 million Fiscal Year 2023 Reconnecting Communities and Neighborhoods Grant to the Oregon Department of Transportation for the I-5 Rose Quarter Improvement Project, which is part of a regional effort to reconnect the Albina neighborhood.

“[The grant was] made to be able to restore, to heal those scars on our community and set up a model for what we can do elsewhere,” explained Rep. Blumenauer at APTA’s Mobility Con-

ference. “Done right, it’s extraordinarily powerful. Done right, it’s within our capacity to maximize those investments. Too often, we’ve seen projects inflicted on people rather than with them...I’d like to think that some of what we’ve done in Portland is a different model. One of inclusion. One of an emphasis on long-term planning and trying to get the most out of those resources.”

### Streetcars and Small Starts

The Portland Streetcar project, which opened in 2001, is one example of a project developed with community support and one that provided a model replicated in other cities.

As Rep. Blumenauer recounts, the development of the modern streetcar movement is rooted in the enthusiasm of a Portland businessperson, Bill Naito, and using that enthusiasm to create public interest in the mode. Naito acquired three antique streetcars in Portugal and convinced TriMet to allow operation of the streetcars along 2.3 miles of the agency’s light-rail line. Rep. Blumenauer called the move a “masterstroke” in gaining the public’s attention and raise excitement, which allowed the plan for the Portland Streetcar to emerge.

Four years after the initial segment of the Portland Streetcar began operation, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users, a surface transportation funding bill, established the Small Starts program. The new program provided a federal funding process for lower-cost fixed guideway and non-fixed guideway projects, including bus rapid transit and streetcar projects.

“The streetcar provided an important niche. It was cheaper. It was faster. It had an opportunity to really capture the imagination in a way that the larger light-rail car didn’t. We have now over two dozen programs around the country that are streetcar and a number of the original ones are now looking at expansion,” said Rep. Blumenauer. “Being able to reignite the interest, for me, was one of the most exciting chapters of anything I’ve been involved with.”

### Funding the future of mobility

Rep. Blumenauer calls reliance on the gas tax to fund the bulk of the nation’s transportation priorities “a losing proposition,” and notes road user charges could provide part of the solution.

While Rep. Blumenauer has lived in Washington, D.C., for 28 years without a car, he does own a vehicle in Oregon and participates in the state’s OReGO program. The program invoices participants a per-mile charge for the miles they drive and the participants receive a non-refundable credit for fuel tax paid when they fill up their tanks at a gas pump.

“Ultimately, we need to have a road user charge,” said Rep. Blumenauer. “A road user charge that keeps track of how far everybody drives is much more efficient, is it is less disruptive and, in the long run, it’s the fairest approach.”

Another concept with potential to financially support broader transportation programs is parking cash out plans, where employers that offer free parking allow employees to use the cash equivalent of that benefit to pay for their choice of transportation options. It could be paying for private parking, gas, transit or a bike – the option is given back to the user.

“Cashing out parking gives commuters more choices, just candidly, it has another advantage, because if they choose to take that benefit in the form of cash, it’s a taxable benefit. That will raise \$20 billion dollars or more over the 10-year budget window and there’s a lot of money that can be redirected for other opportunities to expand the transportation choices for the community,” explained Rep. Blumenauer.

Providing choices is an important part of Rep. Blumenauer’s livable communities ethos.

“As I do work all over the country, I’m watching people understand that there is great value to giving citizens the choice of being able to walk, run, skate, bike or take transit,” said Rep. Blumenauer. “That choice is a very fundamental one and it helps define what I think is the essence of a livable community - giving people more choices - and that mobility choice is one of the most fundamental.”

In November 2023, Rep. Blumenauer announced he would not seek re-election. As his time as an elected official draws to a close and he prepares to become a private citizen, he remains committed to advocating for causes he has long championed, including providing options to communities in how their residents live and connect.

“What I would like to be identified with is this notion of giving people more choices...that to me is very important to be able to take the forces of change to solve problems rather than create new ones,” said Rep. Blumenauer. “I’d like to think with what we’ve done in terms of bike and pedestrians, streetcar, the urban design strategies, that these are things that have given people more choices for their lives and I would like that to be the legacy...for us here in Congress. Bring people together to solve problems and do it in a cooperative way, use proven technology, engage citizens as part of the solutions; these are the things that are enduring and those are the things - I don’t know if they’ll talk about it in 50 years - but those are the things that people will appreciate in 50 years.” L



**U.S. Earl Blumenauer announced in November 2023 he would not be seeking re-election following 28 years in the U.S. House of Representatives and more than 50 years in public service.**

Photo: House Creative Services

For *Mass Transit*'s full interview with Rep. Blumenauer visit:

**MassTransitmag.com/55039148**

# Special Report: 2024 Trends in Passenger Rail

New and expanded rail projects are entering service at an increased pace, while technological advancements and policy changes are shifting how rail transit and passenger rail operators approach safety on their systems.

COMPILED BY MISCHA WANEK-LIBMAN,  
EDITOR IN CHIEF

**F**ollowing a dip in rail openings due to various factors associated with the COVID-19 pandemic, supply chain challenges and construction quality issues, new rail transit and passenger rail projects in North America are being celebrated with ribbon cuttings from Honolulu, Hawaii, to Montreal, Quebec, Canada.

Since the 2023 Rail Special Report was published, several rail projects have entered revenue service, including the Los Angeles County Metropolitan Transportation Authority's Regional Connector, Honolulu's elevated autonomous rail system, Skyline, Réseau express métropolitain South Shore Branch in Montréal, Quebec, Brightline's extension to Orlando, Fla., the Valley Line Southeast light rail in Edmonton, Alberta, TriRail's extension to MiamiCentral Station, Valley Metro's Northwest Phase II extension in Phoenix, Ariz., the first segment of South Transit's Link 2 Line and the Northern Indiana Commuter Transportation District's Double Track Northwest Indiana project.

Additional projects are expected to enter service later in 2024, including Massachusetts Department of Transportation's South Coast Rail project, Metrolinx's Finch West Light Rail Transit and, possibly, its Eglinton Crosstown project.

## Terminology NTD Mode Types

- AR:** Alaska Railroad
- CC:** Cable Car
- CR:** Commuter Rail
- HR:** Heavy Rail
- IP:** Inclined Plane
- LR:** Light Rail
- MG/AG:** Monorail/Automated Guideway
- SR:** Streetcar
- YR:** Hybrid Rail

Numbers reflected in this report used information within the National Transit Database for the modes listed.

Major maintenance projects are also producing operational gains for rail operators. In April 2024, Metropolitan Transportation Authority (MTA) returned regular service to F and M trains following completion of an eight-month track replacement project. In November 2023, the Massachusetts Bay Transportation Authority (MBTA) launched its Track Improvement Program, which aims to eliminate all existing speed restrictions and bring tracks closer to a state of good repair by the end of 2024. Between November 2023 and May 1, 2024, MBTA removed a total of 104 speed restrictions following maintenance work on its Red, Orange, Blue and Green lines.

New and improved services have helped propel ridership gains on rail modes. The American Public Transportation Association Quarterly and Annual Totals by Mode ridership report shows heavy rail, light rail and commuter rail account for 46 percent of all transit trips taken in 2023. All rail modes saw an increase in ridership in 2023 compared to 2022, with heavy rail increasing 14.3 percent, light rail increasing 15.3 percent and commuter rail increasing 18.7 percent. While year over year ridership increases have slowed slightly, ridership as compared to year end 2020 numbers show a robust recovery. Light-rail ridership in 2023 increased 51.3 percent versus 2020, heavy rail increased 75.5 percent and commuter rail increased 80 percent. Regarding intercity passenger rail, Amtrak reports its ridership in Fiscal Year 2023 exceeded 28 million nationwide. The railroad credits this bump to significant growth on the Northeast Corridor, where ridership surpassed pre-pandemic levels since early summer 2023.

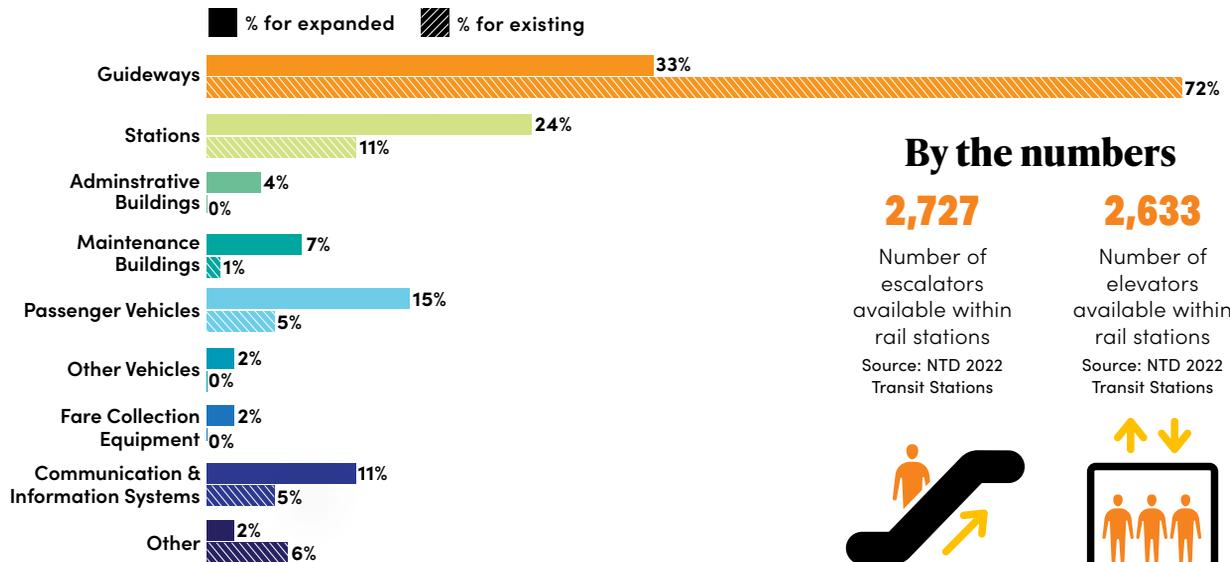
An April 17 hearing of the U.S. House Committee on Transportation & Infrastructure Railroads, Pipelines and Hazardous Materials Subcommittee examined the state of the commuter rail industry and the challenges and solutions found within

it. Among the topics highlighted at the hearing was the challenge commuter railroads face in a hardened insurance market. Mike Noland, president, Northern Indiana Commuter Transportation District and chairman of the Commuter Rail Coalition (CRC), summarized the issue by explaining commuter railroads carry \$323 million in excess liability coverage, which is the federal cap. This cap will be changed in early 2026 in line with the consumer price index and a notice will be published by the U.S. Department of Transportation (USDOT), which will give commuter railroads 30 days to secure the additional coverage.

A maximum of \$32.5 million per railroad can be purchased from domestic insurance carriers, forcing commuter railroads to use overseas insurance markets to secure the balance. The potential outcome for not securing the additional coverage could be suspension of operations.

In a column for *Mass Transit*, CRC CEO KellyAnne Gallagher called the state of the excess liability insurance market “illogical.” CRC is suggesting a multi-state agreement to share liability, the federal government offering a backstop should the excess liability insurance market fail and extending the 30-day implementation window to

## Capital Expenses: Existing vs. Expanded Services



NTD 2022 Capital Use \*Values represent percent of total expense for that group

### By the numbers

**2,727**

Number of escalators available within rail stations

Source: NTD 2022 Transit Stations

**2,633**

Number of elevators available within rail stations

Source: NTD 2022 Transit Stations



365 days as potential solutions to aid commuter railroads.

“Extending the 30-day implementation window to 365 days will ensure commuter railroads in the U.S. can have the time necessary to secure the additional coverage and allow them to operate with confidence. Stabilizing the U.S. insurance market will allow taxpayer money to stay within the borders of the United States. We need both solutions for a prosperous future for commuter rail,” wrote Gallagher.

### Further Safety Enhancements

Rail has statistically been a safe travel mode. The Bureau of Transportation Statistics shows injuries per 100 million passenger train-miles fell from 1,639.6—the highest level during the past 10 years—to 547.7 in 2023. Fatalities per 100 million passenger train-miles fell from 6.7 in 2022 to 0.9 in 2023.

While ambassador programs and increased levels of security personnel have

enhanced safety, rail transit and passenger railroads have also been embracing technology to support their commitment to operating safely and providing a safe environment in which to travel and work.

At the end of June, at the conclusion of a mandatory 90-day advance notice, New York City (NYC) will be piloting electromagnetic weapons detection technology to spot weapons carried by travelers onto the MTA system. NYC Mayor Eric Adams says the New York Police Department seized 1,515 weapons in the subway system in 2023, which is an increase from the 947 weapons seized in the previous year. The pilot program will be rolled out to designated subway stations where it will be evaluated.

Across the Hudson River, New Jersey Transit will be using a Strengthening Mobility and Revolutionizing Transportation Grant (SMART) from USDOT to work with Rutgers University Center for Advanced Infrastructure and Transportation to develop artificial intelligence-based systems to improve safety at light-rail grade crossings by reducing accidents at crossings and rights of way. Stage 1 of the project will prototype a tailored artificial intelligence-powered technology solution consisting of stationary cameras at five light-rail grade crossings and forward-facing cameras in one Hudson-Bergen Light Rail vehicle. Stage 2 of the project will see the technology installed at 50 crossings and five light-rail vehicles.

On the West Coast, Metrolink will use its SMART grant to develop and demonstrate a track intrusion detection

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### By the numbers

**13,950 miles**

Number of track miles transit authorities operate in the U.S.

Source: NTD 2022 Track and Roadway

**8,962 miles**

Number of rail transit grade crossings in the U.S.

Source: NTD 2022 Track and Roadway

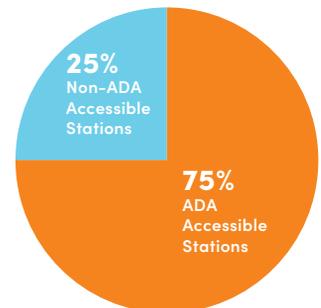
**1,426.4 miles**

Number of elevated track miles transit authorities operate in the U.S.

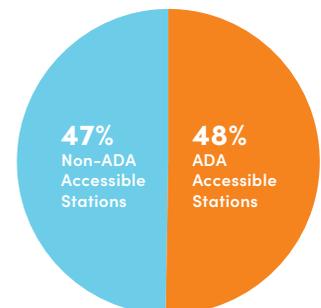
Source: NTD 2022 Track and Roadway

### U.S. Station Accessibility

% of total stations



% of total legacy stations



NTD 2022 Transit Stations

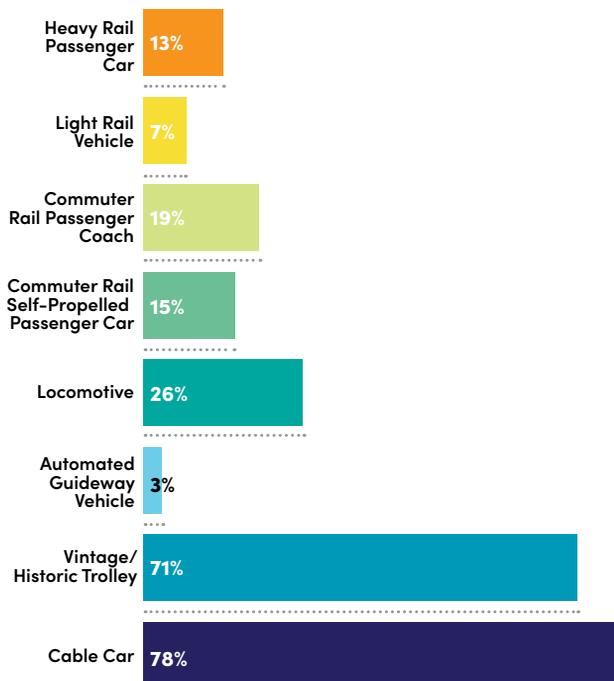
system. The prototype will explore the use of artificial intelligence-equipped cameras and radar or light detection and ranging sensors in connection with Metrolink’s existing Positive Train Control system to identify and validate track intrusions.

One of the more impactful changes coming to rail transit safety concerns a rule change by the Federal Transit Administration (FTA). On March 22, FTA published a Notice of Proposed Rulemaking (NPRM) proposing mandatory minimum standards for trackworkers who work for rail transit agencies. While FTA provides guidance through the National Public Transportation Safety Plan to ensure safety on transit systems, it contains voluntary minimum safety standards. The proposed rule would mandate minimum safety standards for the first time. FTA explained in the NPRM its safety program has matured and it is now appropriate for FTA to propose required minimum standards for Roadway Worker Protection (RWP).

The proposed rule would require rail transit agencies to adopt and implement an RWP Program, establish minimum RWP elements, document RWP programs and implement RWP training.

“This rule will ultimately save lives,” said FTA Acting Administrator Veronica Vanterpool. “Once this rule is finalized, it will support safer conditions for workers who perform critical tasks that keep transit operating efficiently and safely.”

## Percent of Active Vehicles Beyond Their Useful Life



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# Vehicle Design: Managing Noise and Vibration from the Ground Up

In the second of a two-part series, vehicle design efforts to mitigate noise and vibration and the resulting effects on transit/passenger applications are further examined.

BY JEFF TUZIK, CONTRIBUTOR

Briony Croft taking wheel surface measurements.  
Photo: Briony Croft

# R

In Part 1 of this article, a group of experts, including a transit operator, three vehicle manufacturers, and a noise and vibration consultant, examined how to mitigate wheel/rail-generated noise at the source. The discussion took place at the Wheel/Rail Interaction '23 Rail Transit conference, of which *Mass Transit* is the Presenting Sponsor. Part 2 looks further into vehicle design efforts to mitigate noise and vibration and the resulting effects on transit/passenger applications.

ail transit vehicle design doesn't occur in a vacuum. In addition to optimizing individual components of a vehicle, car builders also optimize the vehicle for the rail and track conditions it will encounter. This means that precise track condition data is an important component of the vehicle design process despite not being part of the vehicle.

During the design phase of a new vehicle, car builders use track condition data in concert with their own analyses and simulations to quantify the systemic effects of vehicle/track interaction on:

- Vehicle kinematics, including articulation angles, coupler and carbody clearances and carbody-to-track clearance.
- Vehicle dynamics based on wheel/rail profile interaction, the ability to navigate special trackwork, derailment risk and ride comfort.
- Propulsion and braking requirements, including gradients, station stops, acceleration and deceleration requirements.
- Structural loads/forces—these are subject to customer specification, car builder internal standards and regulatory requirements.

“Structural load assumptions in the design phase are very important: Are you following only the technical specification or only the regulatory requirements? And, what do you do when these come into conflict?” asked Kevin McClain, director of mechanical systems engineering at Siemens Mobility Inc.

Reconciling this conflict requires good data and good communication with the customer.

Siemens recently fulfilled a new vehicle procurement contract that highlights the importance of having and using track and site data in the vehicle design process. This procurement was for an existing network that included historic trackwork and bridges requiring a lightweight vehicle. Sections of the network were also near historic buildings and particularly sensitive to ground-borne vibrations. The network was in a high-gradient landscape, which McClain explained included many steep grades back-to-back, as well as sharp curves and compound curves at grade.

A vehicle optimized for these conditions had to be lightweight, with low unsprung mass and exceptionally fatigue-resistant due to large predicted torsional loads — and it had to be service-proven. Siemens' approach to the project was to first define trackwork criteria based on a combination of track drawings, track measurements and measurements of existing vehicle dynamics. McClain said the aim was to use the worst-case scenario out of these data sources to determine the true operational envelope of a new car.

Siemens instrumented existing cars with a suite of measurement devices to create its own map of the network overlaid with truck and carbody dynamics and loads, correlated by precise location. Among the many parameters Siemens measured, certain track conditions appeared to be particularly consequential in their influence on vehicle performance. These were warp 31 feet, warp 62 feet and narrow gage.

“These are combinations of conditions and forces that can't be found in technical drawings,” McClain said.

Siemens also collected rail profile data and used it to inform multibody simulation (MBS) models—essentially enabling them to run simulated cars over simulated tracks reflecting actual track conditions. Notably, the as-measured track simulated structural loads were, on average, 20 percent higher than the track drawing simulation, McClain added, meaning that a car designed to the track drawing spec would effectively be under-built.

Using this profile data, Siemens developed MBS models to test the individual components of the new car on the as-measured track and identify potentially problematic combinations of components, vehicle dynamics, kinematics, structural loads and locations. Siemens found that the vehicle/track characteristics measured (relating to kinematics, dynamics, propulsion, structural load) more accurately reflected the actual operating conditions than the technical specifications or standards. These were the characteristics that drove the new car design. According to McClain, the lesson here is simple: Accurate track data plays a critical role in the design phase of new car procurement.

## Noise and vibration at the source

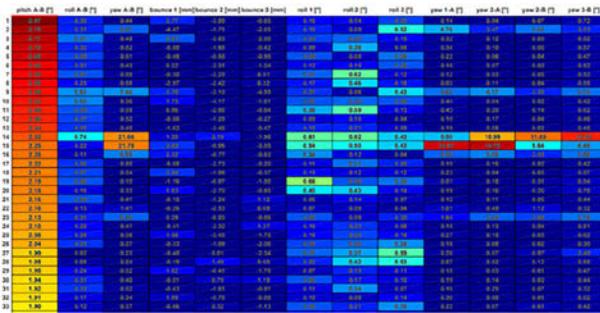
A recent case study in Sydney, Australia, illustrates the impact of vehicle design and selection on ground-borne vibration and noise. The initial focus of the study was a rail corridor for Sydney's heavy rail passenger line (North Sydney) that was undergoing modification for a light-rail extension of the Sydney Metro. At the commencement of the study, only the heavy rail line was in operation. During the months that followed, the inbound track was moved to accommodate construction of two metro tracks between the existing tracks, said Briony Croft, an acoustic engineer and director at Sahaya Consulting (Canada) and Acoustic Studio (Australia).

The study measured vibration at the rail corridor boundary for more than a year (and is ongoing), collecting data on roughly 250 trains per day. The original goal was to measure changes in vibration



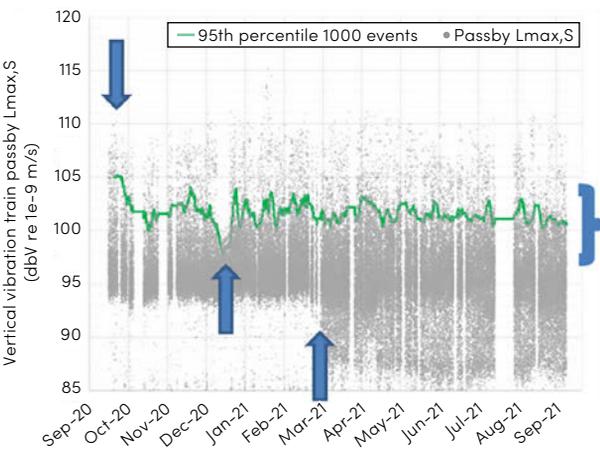
**FIGURE 1. Warp and gage measurements and alerts overlaid on a map of the system.**

Image: Siemens



**FIGURE 2. Chart of potentially problematic combinations of vehicle components based on track data and multibody simulation.**

Image: Siemens



**FIGURE 3. Maximum vibration levels measured over the course of one year.**

Image: Briony Croft presentation

data due to the track configuration changes related to the metro expansion. “We collected so much data that we’ve been able to extrapolate much more than that,” Croft said.

Analysis of this data has yielded information on:

- Long-term trends in vibration levels over time
- Differences between tracks
- Relative vertical and lateral vibration levels
- Repeatability of short-term vibration monitoring
- Effect of train type on vibration levels

Figure 3 shows some of the data collected in the study — specifically vertical vibration data during one year. The green line shows the 95th percentile of maximum vibration levels, averaged more than 1,000 events (95th percentile vibration level is a metric used for vibration standards and compliance in Australia).

Croft noted there are three stand-out points in this data that warrant closer examination. The first is the notable commencement of large numbers of train passby events with lower vibration levels in March 2021. This corresponds to the opening of the new inbound track, which was further away from the vibration sensor. The second is the spike in vibrations at the start of study. This corresponds to a proliferation of wheel flats related to issues with newly-acquired rolling stock. Croft added the issue was resolved soon after data collection for this study commenced, resulting in reduced maximum vibration levels by October 2021.

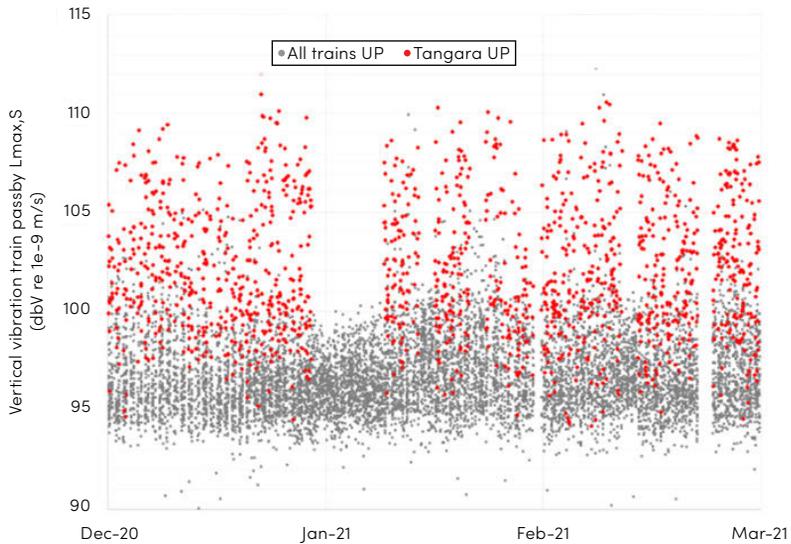
The third is the drop-off of the 95th percentile between December 2020 and January 2021. This corresponds to a period in which maintenance work on the Sydney Harbor Bridge disrupted normal operations. During this period, the line ran a reduced timetable service, utilizing only one train type—the Waratah type.

The Waratah trains were introduced between 2011 and 2018 and make up 81 percent of the traffic on the North Sydney line. Tangara trains, introduced between 1988 and 1995, make up 16 percent of the traffic and the remaining three percent is made up of other train types.

“The Tangara are older but very similar in specification to the Waratah trains,” Croft said. “The differences between these trains becomes quite clear, however, when the Tangara trains are highlighted in the vibration data. The Tangara trains, despite making up a small percentage of the fleet, account for nearly all of the high vibration events. On average, the Tangara trains generated +5 dBV vertical vibrations and +6 dBV.”

Croft explained the Waratah and Tangara trains have very similar suspension systems and only a small difference in unsprung mass; otherwise, the two vehicles are not substantively different. For the Sydney case study, this left wheel flats as the likely culprit for the cars’ different performance.

To compare wheel condition between the two car types, Croft looked at wheel impact load detector (WILD) data network-wide during the same time period as the vibration data. This data showed that out of 866 Waratah cars, 60 (seven percent) generated WILD flags. Of the 447 Tangara cars, 476 (106 percent) generated WILD flags.



**FIGURE 4. Tangara trains represent nearly all high vibration events recorded.**

Image: Briony Croft presentation

Train type	Total cars	New WILD flags in year (% of cars)	Cleared WILD flags	Average days to clear
Waratah	866	60 (7%)	56	91
Tangara	447	476 (106%)	504	44

**FIGURE 5. Wheel impact load detector measurements for both car types.**

Image: Briony Croft presentation

“This made it clear that wheel flats were driving the difference in vibration events,” Croft said.

Maintenance records showed that there was no marked difference in how or where the car types were maintained—in fact, wheel flats were corrected faster, on average, on the Tangara cars versus the Waratahs. This is where the only fundamental design difference between the two cars plays a role. The Tangara cars use DC traction and friction braking at low speeds while the Waratah cars have more modern AC traction systems and use dynamic braking at all speeds. Wheel flats generated as a function of this design difference contributed to significant differences in vibrations. This shows the importance of vehicle design or selection when you’re mitigating vibrations.

“The general assumption was that vibration levels for the two car types should be the same since they’re simply a different generation of the same car,” Croft said.

The Sydney case study illustrates one of the less-obvious ways in which car design can affect a transit system. It also illustrates the fact the optimization of the vehicle/track dynamic doesn’t necessarily end once a vehicle is designed and delivered.

Wheel/rail profile interaction and optimization, like vehicle/track interaction, has a profound influence on the kinds of characteristics and performance specifications that transit systems and car builders target. Wheel and rail profile matching can be part of the new car design/procurement process but it can also be part of the maintenance/operational phase of car deployment.

As Siemens’ McClain detailed, vehicle/track interaction (and optimization) is a critical component of delivering a well-designed vehicle. Wheel/rail interaction takes that optimization a step further, to a more granular level. Transit properties commission wheel/rail studies for many reasons. The goal may be to improve curve performance

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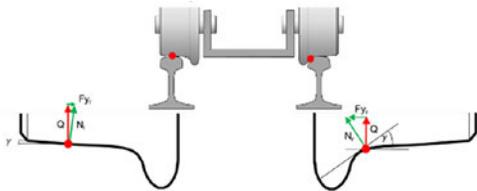
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**Development of an optimized Wheel Profile (Independent Wheels)**

- Determination of contact angle difference

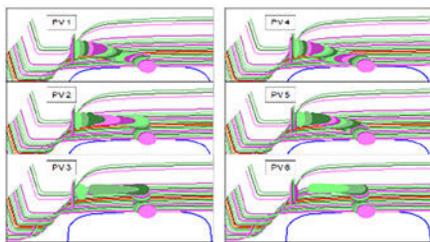


**FIGURE 6.** Independently rotating wheels require profiles with contact angles optimized for both curved and tangent track scenarios.

Image: Alstom

**Development of an optimized Wheel Profile**

- Select appropriate wheel profile(s) for the entire fleet regarding: Contact point distribution



**FIGURE 7.** Contact patch distribution helps spread wear evenly across the running band.

Image: Alstom

or eliminate hunting, for example. Arne Pfeil, product dynamics engineer/railways dynamics expert at Alstom, noted often transit properties commission a study when an aspect of their system begins to perform out of band, perhaps a new vehicle is experiencing excessive flange wear or generating excessive noise.

Regardless of the specific reason for the study, the first step is recording and analyzing the wheel/rail conditions. Alstom collects wheel and rail profile measurements and track geometry data and uses the information to determine an optimized rolling radii difference from the system.

“If you want to run through a curve without any longitudinal creepage, the outer wheel must have a greater radius than the inner wheel,” Pfeil said.

For every curve in the system, there is a dedicated optimal rolling radius difference that does not induce longitudinal creepage. Of course, there are many different curves in every system and wheelsets must be able to navigate them all. Pfeil notes that based on curve distribution, Alstom calculates the best-fit rolling radius difference and wheel conicity that will optimize performance and minimize wheel/rail wear.

This process is different for independently rotating wheels, as they lack an axle to induce longitudinal creepage. However, this also means they don’t have a self-centering effect. In this case, profile optimization involves adjusting the contact angle

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of the wheel. According to Pfeil, increasing the contact angle as the wheel moves toward the flange results in higher lateral forces aimed at preventing flange contact while the wheel is running in tangent track.

Like Siemens and Stadler, Alstom also uses multibody simulations throughout the profile design process to model wear patterns, potential development of two-point contact and the propensity for corrugation to develop, Pfeil said. This allows for the testing of multiple profiles with a level of specificity and granularity not possible in the field, he added.

On the track side, rail reprofiling and transition to one (or more) standard rail profiles typically starts by grinding to a transitional profile and then to the target profile. "The goal is to achieve the target profile as part of the regular grinding program, which is gradual, but more economical," Pfeil said.

Concurrently, intermediate wheel profiles can be designed to better match the reprofiled and non-reprofiled rail conditions. Once the track has fully transitioned into the standard profile (or profiles), multiple wheel profiles can be developed that match the rail and distribute wear more uniformly, in that each profile is designed to contact the rail at a different point.

The process of optimizing wheel and rail profiles is also beneficial in that it feeds back into the new vehicle procurement process when the time arises. The data collected during the process can be used by car builders to further

optimize their designs, as Siemens' Kevin McClain pointed out. Knowing the operating parameters of the track/wheel/rail system means that a vehicle designed for that system can be more specialized and better able to target customer specifications, rather than account for a broad range of sub-optimal operating conditions.

The vehicle procurement and design process touches on nearly every discipline and principle in the rail transit industry. Optimizing performance while minimizing noise and vibration is a process that starts at the vehicle specification and never really ends. The throughline is the importance of good data, thorough analysis, reliable simulation and a holistic approach to vehicle/track interaction. **L**

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#### About the author

**Jeff Tuzik** is managing editor of *Interface Journal* ([www.interfacejournal.com](http://www.interfacejournal.com)).

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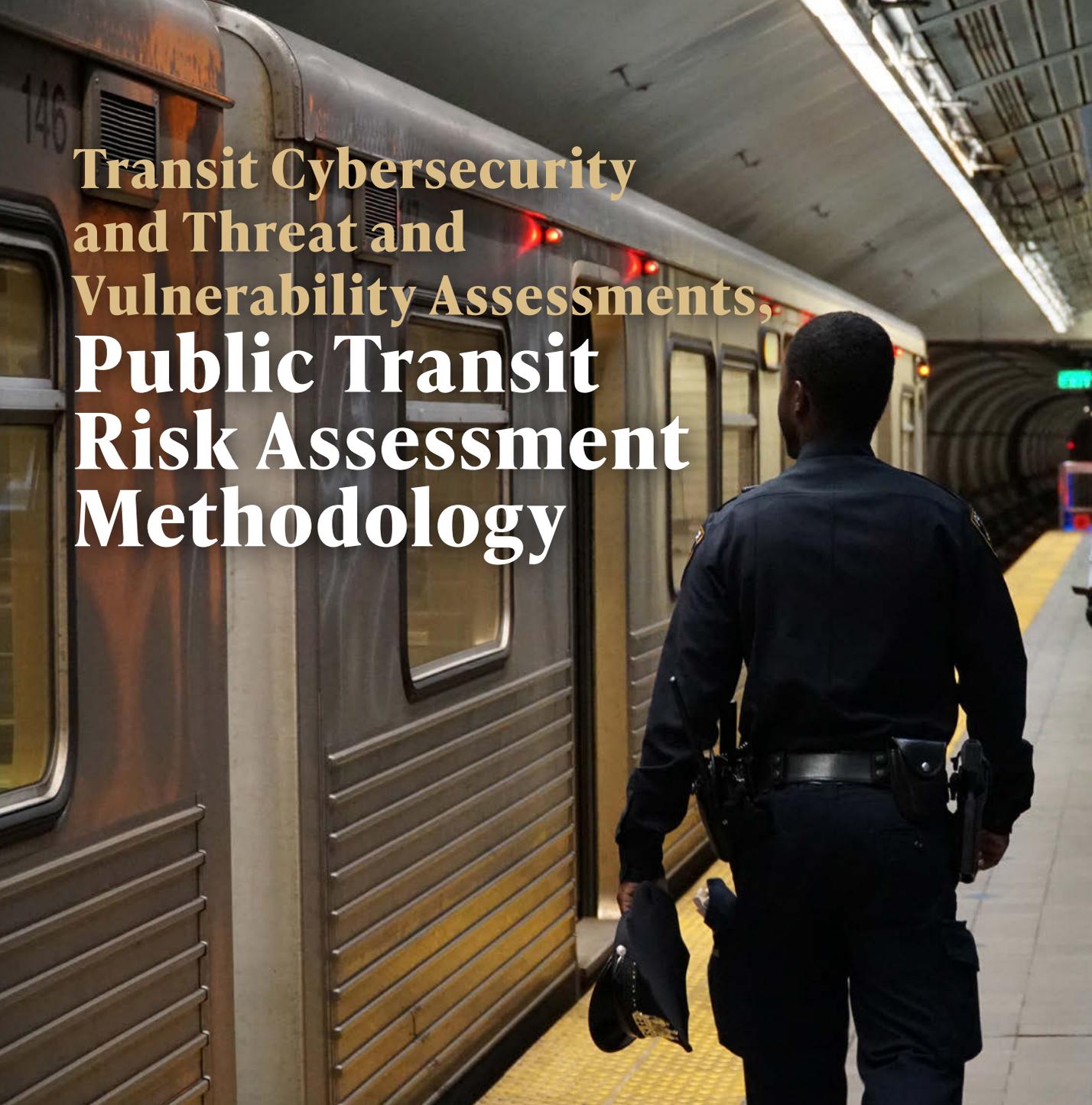
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# Transit Cybersecurity and Threat and Vulnerability Assessments, Public Transit Risk Assessment Methodology

The integration of the PT-RAM process into transit agencies' operational security strategies helps providers address both physical and cyber threats and vulnerabilities.

BY ERIN PLEMONS, CONTRIBUTOR

**I**n the ever-changing landscape of public transportation security, the importance of comprehensive vulnerability assessments has gained increasing recognition among transit and federal agencies. With the commencement of the new fiscal year (FY) 2024 Transit Security Grant Program (TSGP) funds, the Federal Emergency Management Agency (FEMA) has mandated the previously voluntary Public Transit Risk Assessment Methodology (PT-RAM) for transit agencies seeking funding. This pivotal change underscores a strategic enhancement in how transit vulnerabilities are identified, analyzed and mitigated against the backdrop of both physical and cyber threats.



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### PT-RAM Requirements

Until the current FY, FEMA permitted transit agencies to voluntarily complete and submit PT-RAM results as part of a TSGP request. Agencies were encouraged (not required) to utilize PT-RAM materials to allow the agency to develop and implement effective risk mitigation projects. Although submission of the materials was not mandatory to justify funding, PT-RAM provided a methodology to holistically and internally evaluate vulnerabilities and potential threats targeting transit.

In FY 24, FEMA has solidified the requirement to mandate PT-RAM performance within three years of, or in conjunction with, the award of TSGP funding. This new mandate makes PT-RAM obligatory to receive funding while maintaining the intent of the methodology: Addressing security vulnerabilities in transit systems and preparing to combat physical and cyber threats.

PT-RAM is designed to assess risks across a range of asset types and threat scenarios, utilizing inputs from subject-matter experts within the transit agency. The PT-RAM process compels agencies to submit the PT-RAM tool output provided by FEMA, conduct a gap analysis to assess current capabilities and develop an implementation plan outlining strategies and measures to mitigate risks.

### TVA Process

For compliance with the new FEMA requirements, transit agencies must conduct (internally or via a third-party) a comprehensive Threat and Vulnerability Assessment (TVA). A TVA involves analyzing and evaluating vulnerabilities, consequences and mitigation measures associated with essential operations, capabilities, systems, information, policies and internal controls that can be exploited by a broad range of threats and hazards.

The primary purpose of a TVA is to ensure operational survivability in the face of threats, encompassing five pillars: Redundancy, resiliency, endurance, diversity and capacity.

Redundancy ensures the availability of multiple systems or components to provide critical services while resiliency describes the ability of a facility or system to sustain operations despite damaging events. Endurance denotes the pe-

“ A TVA involves analyzing and evaluating vulnerabilities, consequences and mitigation measures associated with essential operations, capabilities, systems, information, policies and internal controls that can be exploited by a broad range of threats and hazards.”

**Erin Plemons,**  
Director, Center for Critical Infrastructure Protection (CCIP)

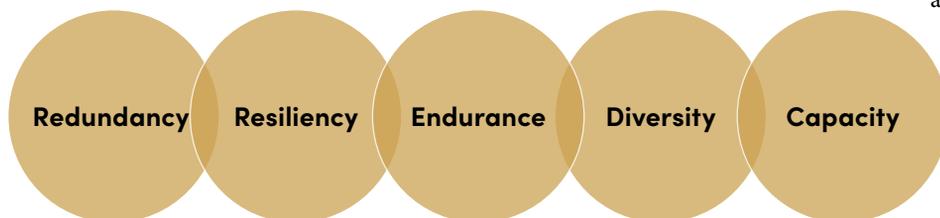
riod for which backup systems provide critical services and diversity refers to the physical separation of redundant systems to reduce the probability of damage. Finally, capacity measures the output that a system or component can provide. With survivability as a goal, transit agencies can uphold these tenants by conducting a thorough TVA and executing a mitigation strategy.

Conducting a robust TVA is crucial in today's complex security landscape. The foundational step involves understanding and documenting the organization's mission and essential functions. This clarity helps to identify assets that need protection, setting the stage for a focused assessment.

After the mission is defined, critical assets must be identified, in collaboration with operations owners, to assist in formulating the scope and direction of the assessment. A comprehensive threat and hazard analysis identifies potential events or circumstances that could harm the organization, ranging from adversarial actions to natural disasters. Once critical assets and potential threats are identified, the next step is to assess vulnerabilities in an integrated and multi-disciplinary approach.

This involves the examination of weaknesses, gaps and strengths surrounding critical

## Survivability of operations, functions and assets



**The five pillars of operational survivability in the face of threats.**

Graphic: Ensco



**An AI-generated image of a public transit system.**

Image: Ensco

assets to determine what resources are necessary for operational continuity under duress. With this information, it is possible to understand system interdependencies, which helps in predicting how a threat to one system could potentially affect others.

Finally, the severity and priority of each vulnerability can be addressed with focused mitigation strategies to ensure operational continuity under a variety of adverse conditions. By systematically conducting a TVA, agencies can develop a nuanced understanding of their vulnerabilities

and implement strategies that significantly enhance their security posture. This comprehensive approach not only protects the organization's assets, but also ensures that it remains resilient when confronted by evolving threats and challenges.

**Cybersecurity and TVAs**

While PT-RAM and TVA processes traditionally focus on physical security, the transit industry's increased dependence on digital infrastructure implores agencies to address both physical and cybersecurity threats and vulnerabilities. Modern TVA methodologies will incorporate cybersecurity considerations throughout the process, providing a holistic view of the threat landscape. Integrating cyber objectives enhances the overall security posture of transit agencies, promoting a cohesive risk management culture that aligns physical and cybersecurity objectives.

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objectives should be complementary layers in a defense strategy, enhancing protection through their interconnected roles. Physical security controls, such as surveillance cameras, access controls and physical locking mechanisms, prevent unauthorized access to critical hardware and infrastructure. These measures protect against physical threats and intrusion attempts, ensuring that data and systems are shielded from direct access.

Conversely, cybersecurity focuses on safeguarding data confidentiality, integrity and availability from digital threats through software solutions and secure configuration. When combined, these controls create a comprehensive security environment. For instance, physical security can prevent cybercriminals from physically accessing a system to install malware while cybersecurity measures protect against a similar remote threat. Together, they form a cohesive security strategy, addressing a wide spectrum of potential vulnerabilities and threats.

### Conclusion

The integration of the PT-RAM process into transit agencies' operational security strategies marks a significant advancement in public transportation security management. FEMA's mandate to perform PT-RAM evaluations strengthens physical security measures while enhancing resilience against cyber threats through a holistic vulnerability management approach. The synergy between PT-RAM and modern TVA methodologies, including cybersecurity considerations, offers a robust framework for addressing the full spectrum of contemporary threats. As transit systems grow more complex and reliant on digital technologies, security assessments are crucial for protecting critical infrastructure and assets, ultimately fostering a secure environment for all users. **L**



### About the author

**Erin Plemons** is director, Center for Critical Infrastructure Protection (CCIP) in Pueblo, Colo.



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**One Fare program**  
sees early success



The program, which launched Feb. 26 and eliminates double fares for customers transferring between public transit agencies in the greater Toronto area, has reached 5 million taps in less than two months.

BY BRANDON LEWIS,  
ASSOCIATE  
EDITOR

n Feb. 26, the government of Ontario, alongside transit agencies throughout the region, launched the One Fare program, eliminating double fares for customers transferring between participating public transit agencies in a wide swath of the Toronto area known as the Greater Golden Horseshoe.

Fare integration between regional transit providers was a well-researched and debated topic among municipal, provincial and mobility leaders. Eliminating double fares could encourage wider use of regional systems, which could save riders time and money, as well as reduce congestion in the growing area. However, elimination of double fares would also mean a loss of fare revenue as the transit industry continues to respond to the shifting ridership patterns brought about by the COVID-19 pandemic.

Enter the government of Ontario, which is spending C\$117 million (US\$85.1 million) per year on the program, with the goal of making regional transit easier to use. The province estimates the program will save riders who use public transit at least five times per week approximately C\$1,600 (US\$1,188) per year on transit costs and deliver an annual boost of up to 8 million transit rides in the region. The province has committed to fund the program without any mandated financial support from other transit agencies until March 2026, with a potential extension depending on the success of the program during the two-year period.

Participants in the One Fare program include:

- Toronto Transit Commission (TTC)
- York Region Transit (YRT)
- GO Transit
- Brampton Transit
- Durham Region Transit
- MiWay

Under the program, for example, adult fare customers transferring between the TTC and GO Transit will save C\$3.30 (US\$2.42) on a single trip while customers utilizing the TTC and YRT will save up to C\$3.88 (US\$2.44) on a single adult trip taken between the two agencies within the two-hour free transfer. According to the TTC, approximately 13 percent of its customers currently start or end their trip outside of Toronto and 87 percent of its customers travel locally within Toronto.

The program builds co-fare agreements the government of Ontario integrated in 2022 to eliminate fares between GO Transit and 12 regional transit agencies in the Greater Golden Horseshoe. The government of Ontario is working to make transit an easy and convenient choice for its growing region. By 2031, the government of Ontario will introduce two-way, all-day GO train service, every 15 minutes in key corridors in the Greater Golden Horseshoe to connect more people to transit, jobs and housing.

Vijay Thanigasalam, Ontario's associate minister of transportation, says the launch of the One Fare program was a long time coming.

"Public transit riders like seniors, students and daily commuters who rely on public transit made it very loud and clear

A PRESTO Card being  
swiped against a  
PRESTO fare reader.

Photo: York Region Transit



**A PRESTO card.**

Photo: Metrolinx

to the government [of Ontario] that they want to have a one fare program to make sure they eliminate the double fare, sometimes even triple fare, when they go from one transit jurisdiction to another municipal transit jurisdiction,” Thanigasalam said.

According to Tamas Hertel, YRT’s manager of service planning, the implementation of the One Fare program modernizes the region’s transportation systems.

“This is something York Region Transit staff and council have been advocating for years,” Hertel said. “There are

many different jurisdictions around the world where programs like this already exist and transit customers don’t see boundaries. They want to get from place to place no matter where and what jurisdiction they’re going to.”

**PRESTO payment system**

As part of the One Fare program, many of the transit agencies involved started using the PRESTO payment system, which is a universal payment system across the region that provides the foundation upon which the One Fare program can be built by automatically calculating the discount applying it to the riders payment method. Riders can pay using a physical PRESTO card, a virtual PRESTO card through Google Wallet or their personal credit card. PRESTO is expected to be implemented on Apple Wallet later in 2024.

YRT started using the PRESTO system in 2011. According to Hertel, being able to tap various cards on a PRESTO reader makes riders comfortable paying for their fare, no matter which system they ride.

“When we first started using PRESTO on our transit system, it made management of fares easier for York Region Transit with data and digitization and for customers,” Tamas said. “It allowed them to track their travel patterns and have more options for fare media. Since then, we have worked with the province to improve the system, including with open and contactless payments. PRESTO has also allowed us to switch to fare capping.”

Metrolinx says the One Fare program has made paying for fares throughout its different transit systems seamless for customers and operators.

“We have more than 20 different transit operators, including GO Transit as a transit operator, and so when customers are moving from one area to the other, these cross- boundary changes requires a transfer and in that transfer is an extra payment,” explained Karla Avis-Birch, Metrolinx’s chief planning officer. “We want to move these kinds of barriers.”

**Ridership**

Avis-Birch notes feedback on the program from customers has been positive, with riders giving pros and cons of the program. Metrolinx is using the program to attract riders back to public transit post-COVID-19 pandemic.

“Post-pandemic, it’s very different right now the way people are moving,” Avis-Birch said. “People are not just moving from the outer regions into the downtown of the Toronto core, they’re wanting to move around the region. They’re wanting to move between regions and that kind of idea of trip planning and removing those barriers really makes for a more seamless and integrated transit network.”

According to Avis-Birch, the pandemic changed the patterns of ridership for Metrolinx. Pre-pandemic, transit use on Metrolinx systems would only mostly be used in the morning and evening commutes. Post-pandemic, midday rides on Metrolinx systems have increased and more people are crossing between regions, making the need for the One Fare program more warranted.

For more information, visit [www.MassTransitmag.com/10065706](http://www.MassTransitmag.com/10065706)

## Future of One Fare program

Tamas noted YRT and other agencies involved in the One Fare program have met with the government of Ontario in roundtable discussions on ways to improve the program. The goal is to eventually include more transit agencies in the Greater Toronto area into both the PRESTO payment system and the One Fare program.

Avis-Birch adds the One Fare program should lead to more service integration, citing the ability to make more connections between the transit agencies.

“In the future, what I see is this opening up the door and enabling us to have more service integration, making those train meets connect better, understanding what we call the first mile, last mile, about how people are going to get from their homes to the station,” Avis-Birch noted. “The road networks are jammed as they are. We only have a limited amount of parking so really creating more opportunities, more partnerships to make it easy and seamless for people to get into the transit network and get where they need to go easily.”

She noted there is an idea the One Fare program is going to resolve all the region’s transit issues, which is unrealistic, but the program will set the region up for ongoing growth. .

“This idea of sustainable regional transit network for all is an ongoing mission,” Birch said. “We are not stopping, particularly about connecting communities, and we don’t know what’s going to happen tomorrow, but we do want to continue to grow and reach the customers that we need to reach. I do think that, ultimately, growth is the name of the game, but not growth for growth’s sake, growth in really matching the needs of the people in the region for where they need to live, work and play.”

In two months, the program has seen 5 million taps, which Thanigasalam views as a massive success but reiterates the program is young and has tons of room to grow.

“We are investing to make sure the future generation, the current generation and our seniors have the potential

to go wherever they need to go without worrying about the cost of transit,” Thanigasalam said. “We not only want to make transit more affordable for everybody in the region, but more accessible so that anyone can just tap their credit or PRESTO card on a reader or by using their smartphone. This is only the beginning of what we hope is a successful partnership with transit agencies across the Greater Toronto area for years to come.” L

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# CUTRIC continues steps towards **cleaner transit and community**

The second and third phases of the Pan-Canadian Battery Electric Bus Demonstration and Integration Trial will further explore collaborations between bus manufacturers and BEB charger manufacturers to establish a set standard for what clean transit energy should be.

BY EMAN ABU-KHALED, ASSOCIATE EDITOR

**Brampton Transit operated eight electric buses on two routes during Phase 1 of the trial.**

Photo: CUTRIC





**Phase II of the Pan-Canadian Battery Electric Bus Demonstration and Integration project will look at new technologies in autonomy and charging.**

Photo: CUTRIC

the program can plug into the OppCharge protocol, which is an open protocol jointly developed with the Volvo Bus Corporation. The protocol standardizes the design of the off-board pantograph that connects the high-powered charging station to the bus, communications between the bus and the charger and performance metrics of the overall system. The chargers were built to the same specifications and could be plugged into any of the transit agencies BEBs.

“While transit agencies demonstrate environmental leadership, they also improve air quality while passengers enjoy quieter, cleaner and more comfortable rides,” Smith said. “The community benefits from reduced greenhouse gas emissions, improved public health and enhanced quality of life.”

“

“We are seeing folks from agencies across Canada showing up to get involved in this project so they can figure out how to leapfrog ... slowdowns in decarbonization planning.”

**Josipa Petronic**, CUTRIC Executive Director and CEO

**A greener future in transit and the community**

A broader perspective of this project is to promote a full transition to zero-emissions fleets. Greener transportation vehicles stand to benefit a wide range of stakeholders, including transit agencies, passengers and the community. CUTRIC is working to set a precedent for large greenhouse gas (GHG) producers by showcasing the feasibility and benefits of electrifying public transit, which CUTRIC says will encourage other industries to follow suit, leading to greater reductions in GHG emissions and fostering a culture of sustainability across other industry sectors.

In this program, participating agencies demonstrated GHG savings between 629 -1477 tCO<sub>2</sub>eq during 30 months.

According to the U.S. Environmental Protection Agency’s GHG Equivalencies Calculator, that’s the equivalent of avoiding 150-352 gas-powered passenger cars being driven for one year.

“People that run transit across Canada are realizing now how big and expensive decarbonization is going to be,” said CUTRIC Executive Director and CEO Josipa Petronic. “We are seeing folks from agencies across Canada showing up to get involved in this project so they can figure out how to leapfrog what might be years of pre-pandemic and pandemic-era slowdowns in decarbonization planning. We expect another successful project that shows how data analysis can lead to demonstration and commercialization success.”

**What’s next**

Phase II will launch with its first group participants coming together for a planned meeting in June 2024. The expected completion date for Phase II is set for the end of 2025. CUTRIC will be using data and reports from the second phase to prepare for Phase III, which is already being planned.

Phase III will launch alongside some of the work CUTRIC is doing in Phase II, focusing on new technologies in autonomy and charging. In Phase III, a new commercialization demonstration project will be in the works, with a focus on standardized and interoperable autonomous bus integration with inductive charging potential for limited applications.

CUTRIC is working to create a greener environment through the transit industry, bus by bus.

“I hope folks realize that we have only just begun the electrification journey — it’s going to be big, complicated and expensive but it’s necessary,” Petronic said. “One more wildfire season and Canadians will be lamenting any slowdown in climate action. We need this conversion and all the hard lessons to be learned from it to go forward, to be implemented and to be built upon by 2030 to be able to prove that – as humans—we can live sustainably.” **L**

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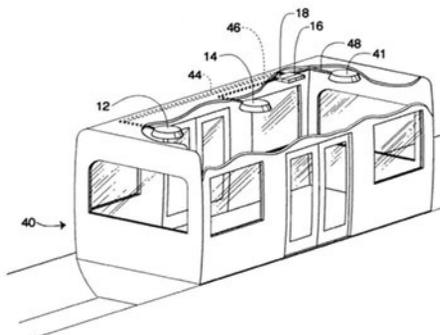
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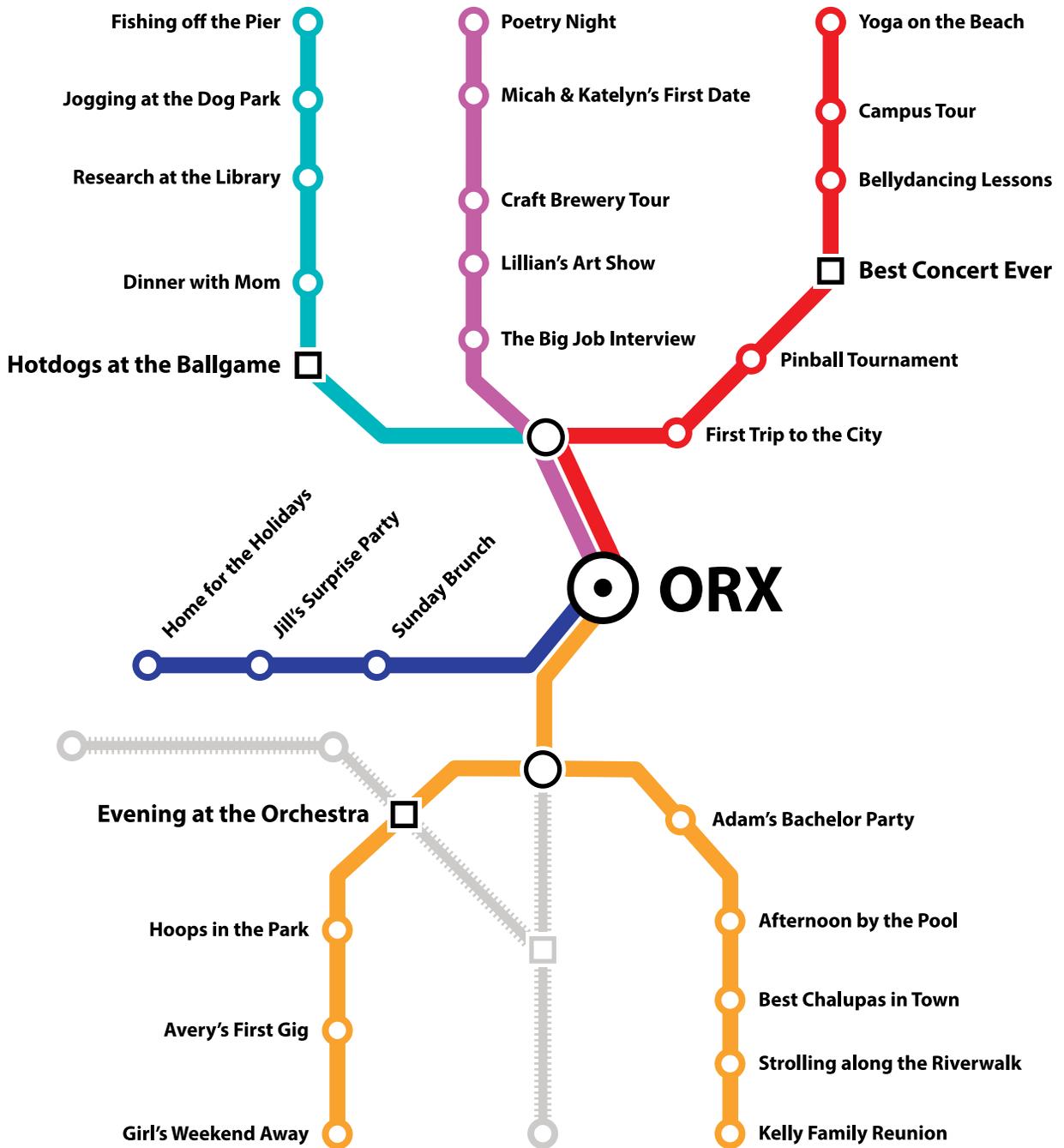


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